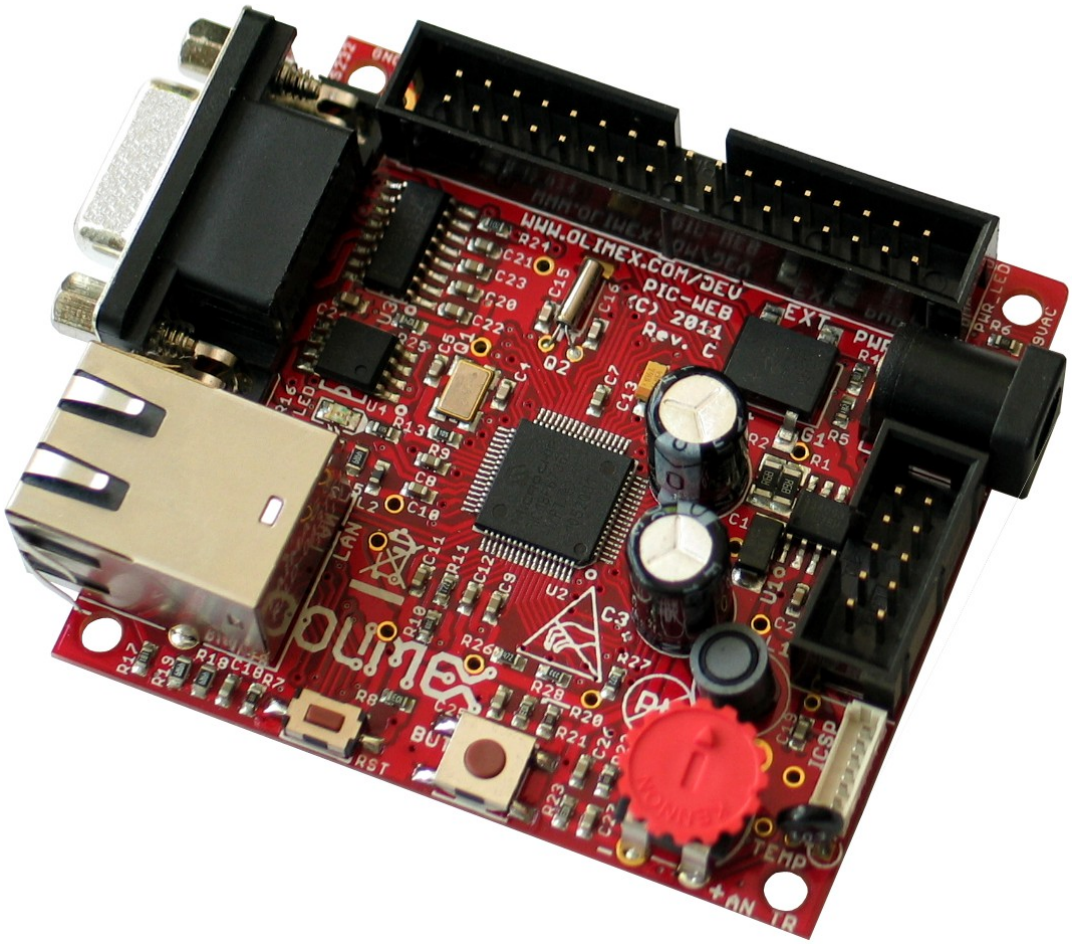

PIC-WEB revision C development board

User's Manual

Pb-free, Green

All boards produced by Olimex are ROHS compliant

Document revision D, April 2014

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INTRODUCTION

PIC-WEB is a compact (65x60 mm) board which is supported by Microchip's open source TCP-IP stack AN833. The board is designed with 64-pin high-performance, 1 Mbit Flash microcontroller with Ethernet - PIC18F67J60 and supports: SLIP, ARP, IP, ICMP, TCP, UDP, HTTP, DHCP, FTP. The Microchip stack is written very modular and flexible and you can enable or disable modules and supports dynamic web pages which give you the possibility to control all PIC resources remotely via FTP, HTTP, UDP, TCP etc. With this board you can implement web and ftp server, send e-mails and almost everything what the big servers do. The on board 1Mbit serial flash is available for data storage.

This board is designed to have Web page of no more than 128 kB. If you want a lot of images in your application you can also host them on other server visible on the network where you have the PIC-WEB connected. The potential of the board is to generate a fluid communication between some specific sensors or actuators across a TCP/IP net including the controls of it.

The Microchip stack is an open source library, which is possible to modify and compile at any time. But you will probably need to modify it to your own needs. The board comes with an implemented WEB server and a web page that let you controls some of the features of the board. In this manual we'll learn about how to compile the TCP/IP stack to use it over the platform, the needed software, how to use the pre loaded web page, and how to upload your own web pages in the board.

This manual requires Microsoft Windows© OS because several software units used here are Windows compatible only.

BOARD FEATURES

- PIC18F67J60 microcontroller
- 1Mbit on board serial flash for web pages storage
- ICSP/ICD mini connector for programming and debugging with PIC-ICD2, PIC-ICD2-POCKET and PIC-ICD2-TINY.
- Reset button
- User event button
- Analogue trimmer potentiometer
- Thermistor for temperature monitoring
- RS232 driver and connector
- Complete web server and TCP-IP stack support as per Microchip's open source TCP-IP stack
- Power plug-in jack for +9 to +12 VDC power supply
- Voltage regulator +3.3V and filtering capacitors
- status LED
- UEXT connector
- Extension header to connect to other boards
- PCB: FR-4, 1.5 mm (0,062"), solder mask, silkscreen component print
- Dimensions (60x65)mm ~ (2.36x2.55)"

ELECTROSTATIC WARNING

The PIC-WEB board is shipped in protective anti-static packaging. The board must not be subject to high electrostatic potentials. General practice for working with static sensitive devices should be applied when working with this board.

BOARD USE REQUIREMENTS

Cables: Depends on the used programming/debugging tool. It could be 1.8 meter USB A-B cable to connect PIC-ICD2, PIC-ICD2-POCKET or PIC-KIT3 to USB host on PC or Serial DB9 cable in case of PIC-ICD2-TINY or other programming/debugging tools. You will need a serial cable if not for programming, than for configuring the board. You will also need a Crossover Ethernet cable.

Note: PIC-KIT3 is recommended for new designs since PIC-ICD2 programmers are not supported in Microchip's MPLAB X IDE. If you don't mind using MPLAB 8.xx then PIC-ICD2 is also a good choice.

Hardware: Programmer/Debugger – most of Olimex programmers are applicable, for example **PIC-ICD2**, **PIC-ICD2-POCKET, PIC-ICD2-TINY, PIC-Kit3** or other compatible programming/debugging tool.

For programming PIC-WEB Rev. C, you will also need PIC-ICSP connector.

!!!Warning!!! When you want to program this microcontroller with PIC-ICD2, PIC-ICD2-POCKET or PIC-ICD2-TINY, before connecting the programmer to your target board, you should first connect the programmer to your computer and open MPLAB. There, first from menu Configure – Select Device – choose the microcontroller you are about to program, then from menu Programmer – Select Programmer – choose MPLAB ICD 2, wait while MPLAB is downloading operation system, and after ICD2 is connected – check in menu Programmer – Settings – Power – there is option – Power target circuit from MPLAB ICD 2 – this option should be forbidden, you could not select it. Now it is safe to connect the programmer to your target board.

Software: PIC-WEB is tested with **MPLAB IDE v.8.92 + C18 compiler 3.44 Free Standart EVAL Version**. The latest modified stack version we tested the board with is TCP/IP stack 5.42 (www.microchip.com). It is possible that the stack might not function properly if used with later versions of MPLAB IDE. You will also need a terminal program configured at 19 200 bps, 8N1 and XON/XOFF flow control (it's described below).

PROCESSOR FEATURES

PIC-WEB board uses CPU **PIC18F67J60** from Microchip with these features:

- **Operating Frequency –** DC – 41.67 MHz
- **Flash program memory (bytes)** – 128k
- **Flash program memory (Instructions)** – 65532
- **SRAM data memory (bytes)** – 3808
- **Interrupt Sources** – 26
- **Ethernet TX/RX Buffer (bytes)** – 8192
- **I/O Ports** – A, B, C, D, E, F, G
- **I/O Pins** – 39
- **10-Bit A/D (ch)** – 11
- **Capture/Compare/PWM Modules** – 2
- **Enhanced Capture/Compare/PWM Modules** – 3
- **Serial Communications –** MSSP (1), Enhanced USART (1)
- **SPI**
- **Master I^2C™**
- **Comparators** – 2
- **Timers 8/16-Bit** – 2/3
- **Resets (and Delays)** - POR, BOR, RESET Instruction, Stack Full, Stack Underflow, MCLR , WDT (PWRT, OST)
- **Instruction Set –** 75 Instructions, 83 with Extended Instruction Set Enabled

Ethernet Features:

- IEEE 802.3 compatible Ethernet Controller
- Integrated MAC and 10Base-T PHY
- 8-Kbyte Transmit/Receive Packet Buffer SRAM
- Supports one 10Base-T Port with Automatic Polarity Detection and Correction
- Programmable Automatic Retransmit on Collision
- Programmable Padding and CRC Generation
- Programmable Automatic Rejection of Erroneous Packets
- Activity Outputs for 2 LED Indicators
- Buffer:
    - Configurable transmit/receive buffer size
    - Hardware-managed circular receive FIFO
    - Byte-wide random and sequential access
    - Internal DMA for fast memory copying
    - Hardware assisted checksum calculation for various protocols

- MAC:
  - Support for Unicast, Multicast and Broadcast packets
  - Programmable Pattern Match of up to 64 bytes within packet at user-defined offset
  - Programmable wake-up on multiple packet formats
- PHY:
  - Wave shaping output filter
  - Loopback mode

Flexible Oscillator Structure:

- Selectable System Clock derived from single 25 MHz external source:
  - 2.78 to 41.67 MHz
- Internal 31 kHz Oscillator
- Secondary Oscillator using Timer1 @ 32 kHz
- Fail-Safe Clock Monitor:
  - Allows for safe shutdown if oscillator stops
- Two-Speed Oscillator Start-up

Peripheral Highlights:

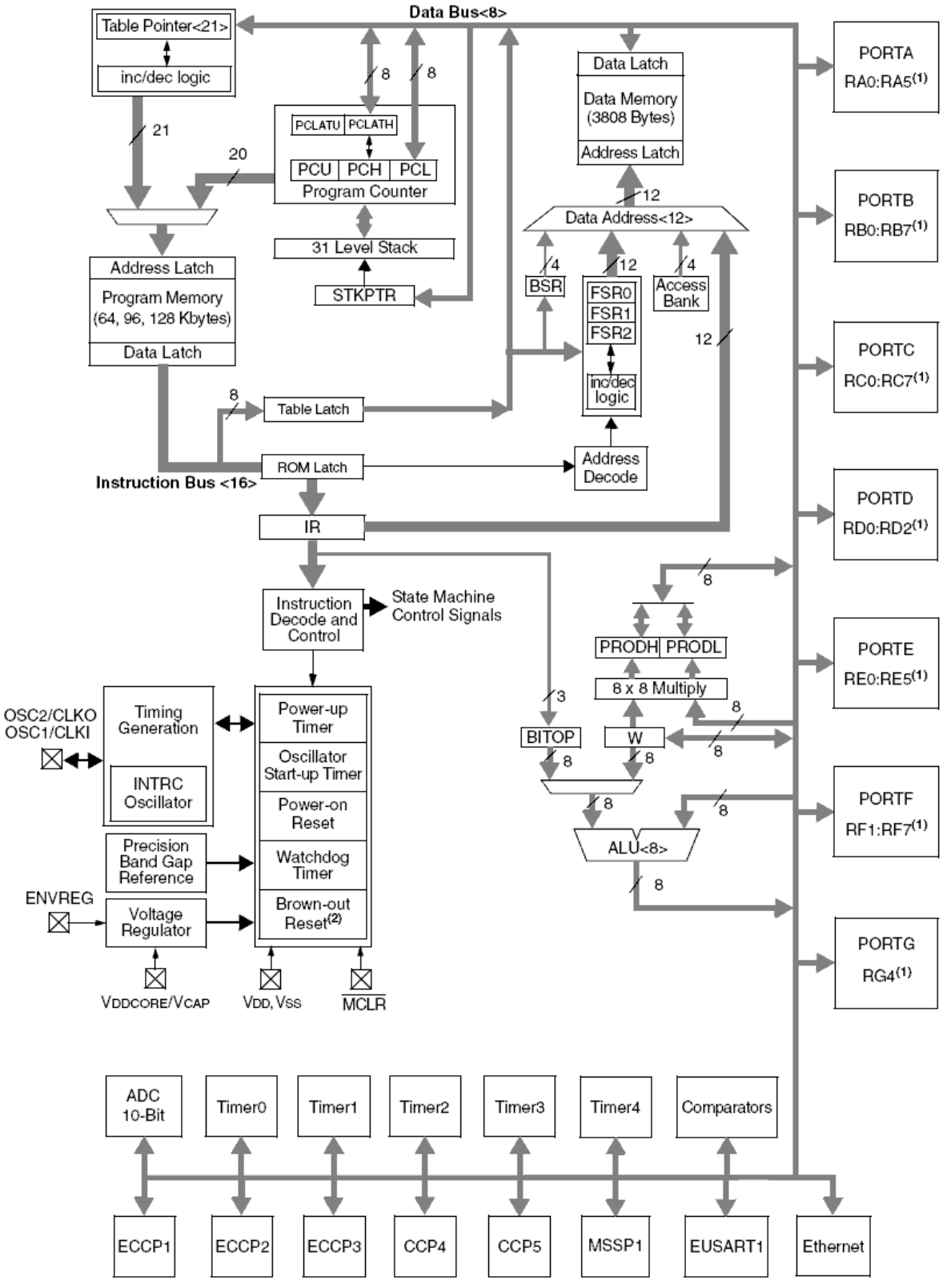
- High-Current Sink/Source: 25 mA/25 mA on PORTB and PORTC
- Five Timer modules (Timer0 to Timer4)
- Four External Interrupt pins
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
  - One, two or four PWM outputs
  - Selectable polarity
  - Programmable dead time
  - Auto-shutdown and auto-restart
- Up to two Master Synchronous Serial Port (MSSP) modules supporting SPI (all 4 modes) and I2C™ Master and Slave modes
- Up to two Enhanced USART modules:
- Supports RS-485, RS-232 and LIN 1.2
  - Auto-wake-up on Start bit
  - Auto-Baud Detect
- 10-Bit, up to 16-Channel Analog-to-Digital Converter module (A/D):
  - Auto-acquisition capability
  - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital-only pins)

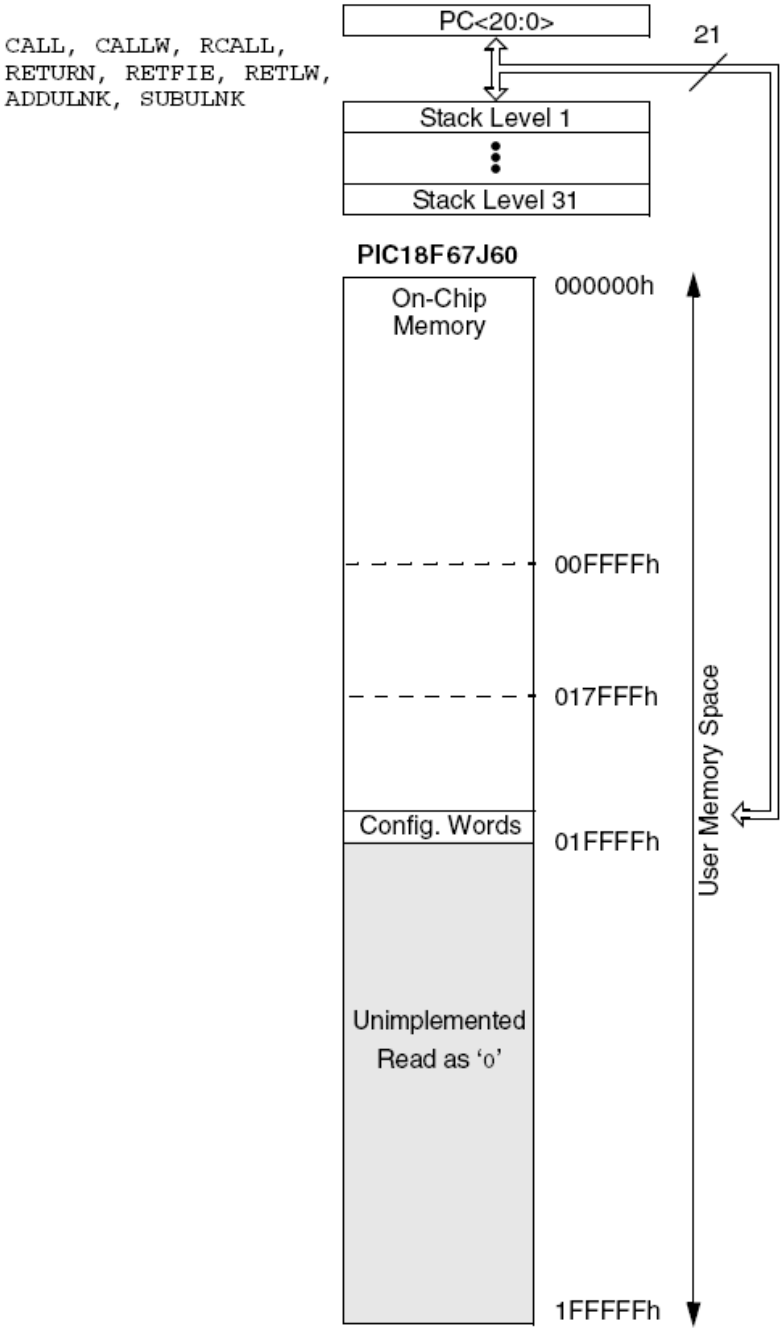
- Low-Power, High-Speed CMOS Flash Technology:
    - Self-reprogrammable under software control
- C compiler Optimized Architecture for re-entrant code
- Power Management Features:
    - Run: CPU on, peripherals on
    - Idle: CPU off, peripherals on
    - Sleep: CPU off, peripherals off
- Priority Levels for Interrupts
- 8x8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
    - Programmable period from 4 ms to 134s
- Single-Supply 3.3V In-Circuit Serial Programming™ (ICSP™) via two pins
- In-Circuit Debug (ICD) with 3 Breakpoints via two pins
- Operating Voltage Range of 2.35V to 3.6V (3.14V to 3.45V using Ethernet module)
- On-Chip 2.5V Regulator

BLOCK DIAGRAM



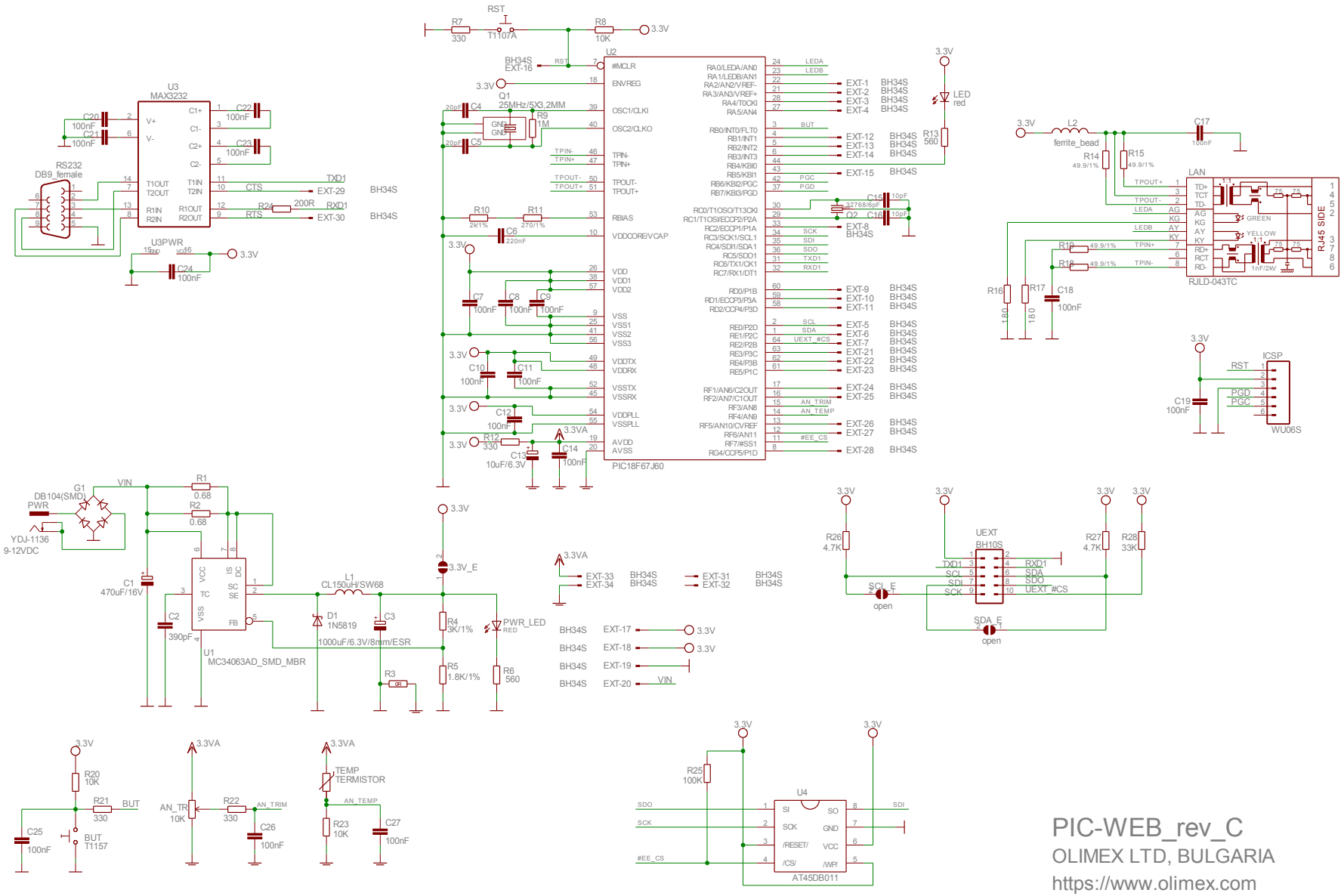
Note 1: BOR functionality is provided when the on-board voltage regulator is enabled.

MEMORY MAP of PIC18F67J60

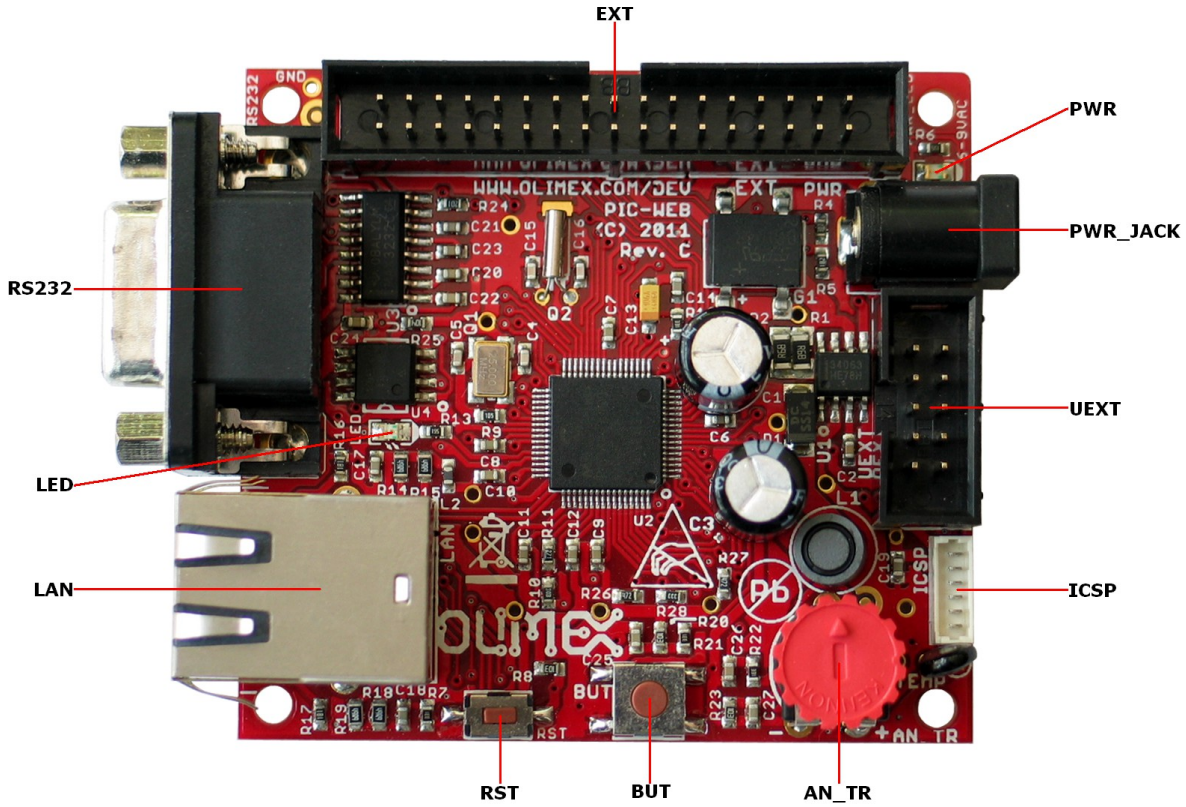


Note: Size of memory area is not to scale. Size of program memory area is enhanced to show detail.

SCHEMATIC


U3
MAX3232
RS232
DB9_female
U3PWR
TXD1
RXD1
CTS
RTS
EXT-29
EXT-30
BH34S
RST
T1107A
U2
PIC18F67J60
Q1
25MHz/5X3.2MM
LED
red
L2
ferrite_bead
LAN
RJLD-043TC
RJ45 SIDE
ICSP
WU06S
G1
DB104(SMD)
YDJ-1136
9-12VDC
U1
MC34063AD_SMD_MBR
D1
1N5819
L1
CL150uH/SW68
PWR_LED
UEXT
BH10S
open
AT45DB011
TEMP
TERMISTOR
PIC-WEB_rev_C
OLIMEX LTD, BULGARIA
https://www.olimex.com

BOARD LAYOUT



POWER SUPPLY CIRCUIT

PIC-WEB can take power from two sources:

- PWR_JACK where (9-12) VDC is applied by external power source.
- EXT-20 pin VIN with the same voltage range.

The board power consumption is: about 130 mA with all peripherals and MCU running at full speed.

RESET CIRCUIT

PIC-WEB reset circuit is made with R8 (10k) pull-up, R7 (330R) serial resistor and RST button.

Although on the schematic is made provision for external reset through EXT-16 pin. Manual reset is possible by the RST button.

CLOCK CIRCUIT

Quartz crystal 25 MHz is connected to **PIC18F67J60** clock in and clock out.

Quartz crystal 32.768 KHz is connected to **PIC18F67J60** T1OSO and T1OSI pins for it's internal Real Time Clock.

JUMPER DESCRIPTION

3.3V_E

When this jumper is closed, it enables 3.3V board power supply.
Default state is closed.

SCL_E

When this jumper is closed, it connects UEXT pin 5 (SCL) to UEXT pin 9 (SCK), respectively PIC18F67J60 pin 2 (RE0/P2D) to PIC18F67J60 pin 34 (RC3/SCK1/SCL1).
Default state is opened.

SDA_E

When this jumper is closed, it connects UEXT pin 6 (SDA) to UEXT pin 7 (SDI), respectively PIC18F67J60 pin 1 (RE1/P2C) to PIC18F67J60 pin 35 (RC4/SDI1/SDA1).
Default state is opened.

When jumpers SDA_E and SCL_E are opened, UEXT pin 5 (SCL) is connected only to PIC18F67J60 pin 2 (RE0/P2D) and UEXT pin 6 (SDA) is connected only to IC18F67J60 pin 1 (RE1/P2C), so you have to use software I^2C. If you want to use hardware software, you have to close (short) jumpers SDA_E and SCL_E, but note that this will short PIC18F67J60 pin 2 (RE0/P2D) to PIC18F67J60 pin 34 (RC3/SCK1/SCL1) and PIC18F67J60 pin 1 (RE1/P2C) to PIC18F67J60 pin 35 (RC4/SDI1/SDA1).

INPUT/OUTPUT

One user button **BUT** – connected to PIC18F67J60 pin 3 (RB0/INT0/FLT0).

Reset button **RST** – connected to PIC18F67J60 pin 7 (#MKLR).

Status red **LED** connected to PIC18F67J60 pin 44 (RB4/KBI0).

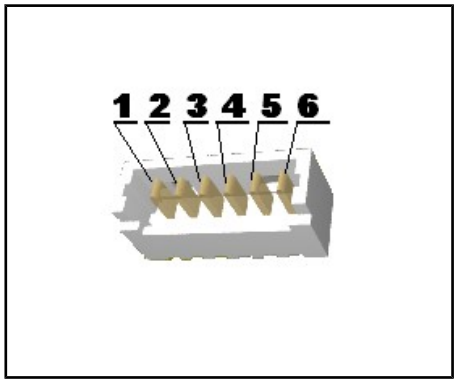
Power supply red LED **PWR** – indicates that external power source is applied and board power supply is applied.

One trimmer **AN_TR** is connected to PIC18F67J60 pin 15 (RF3/AN8).

EXTERNAL CONNECTORS DESCRIPTION

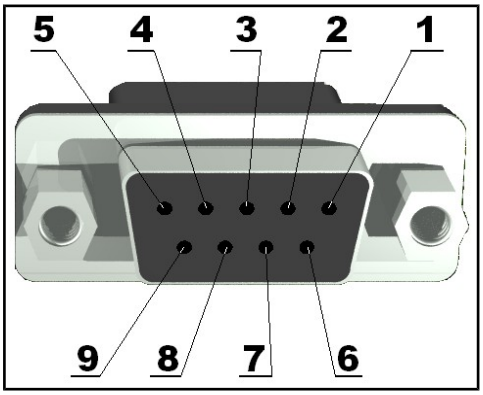
ICSP

Pin #	Signal Name
1	RST
2	VCC
3	GND
4	PGD
5	PGC
6	Not Connected



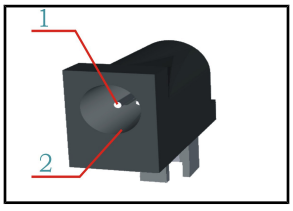
RS232

Pin #	Signal Name
1	Not Connected
2	T1OUT
3	R1IN
4	Not Connected
5	GND
6	Not Connected
7	R2IN
8	T2OUT
9	Not Connected

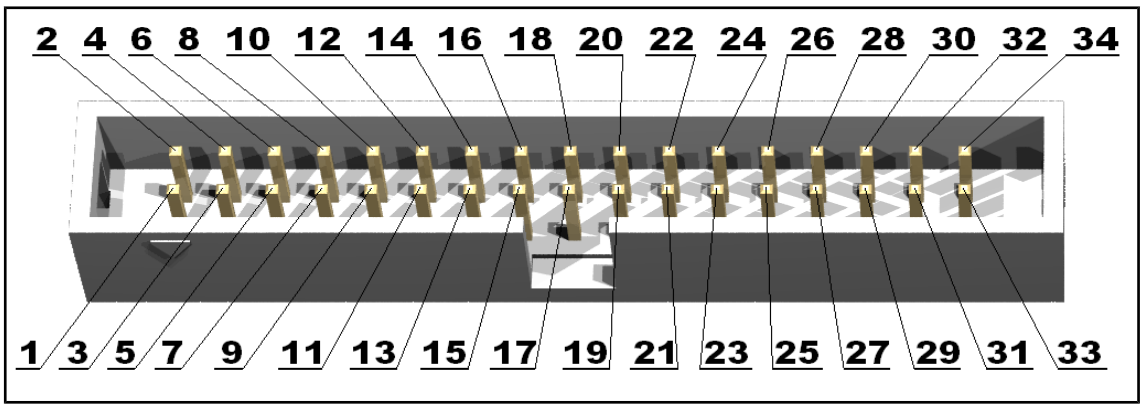


PWR_JACK

Pin #	Signal Name
1	Power Input
2	GND



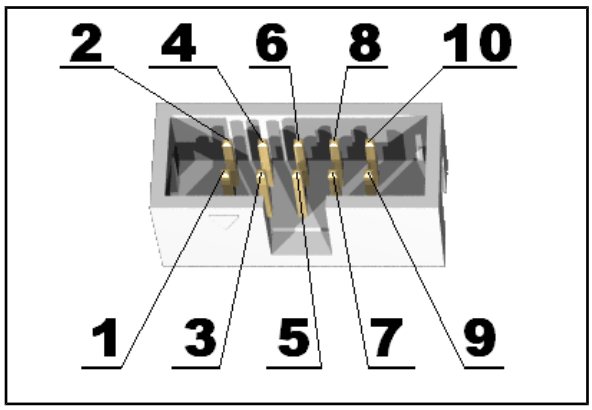
EXT



Pin #	Signal Name	Pin #	Signal Name
1	RA2/AN2/VREF–	2	RA3/AN3/VREF+
3	RA4/T0CKI	4	RA5/AN4
5	RE0/P2D	6	RE1/P2C
7	RE2/P2B	8	RC2/ECCP1/P1A
9	RD0/P1B	10	RD1/ECCP3/P3A
11	RD2/CCP4/P3D	12	RB1/INT1
13	RB2/INT2	14	RB3/INT3
15	RB5/KBI1	16	RST
17	+3,3V	18	+3.3V
19	GND	20	VIN
21	RE3/P3C	22	RE4/P3B
23	RE5/P1C	24	RF1/AN6/C2OUT
25	RF2/AN7/C1OUT	26	RF5/AN10/CVREF
27	RF6/AN11	28	RG4/CCP5/P1D
29	CTS	30	RTS
31	NC	32	NC
33	3.3VA	34	GNDA

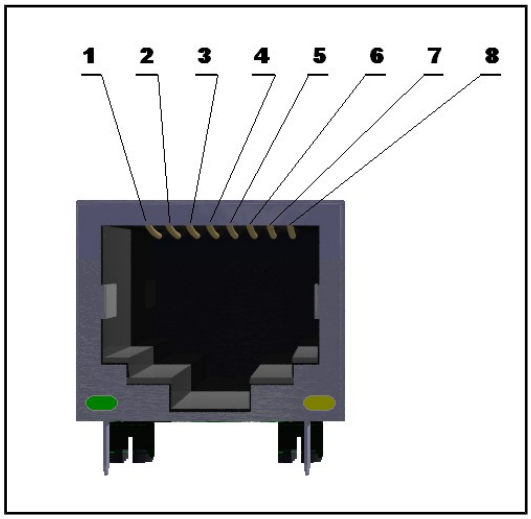
UEXT

Pin #	Signal Name
1	VCC
2	GND
3	TXD1
4	RXD1
5	SCL
6	SDA
7	SDI
8	SDO
9	SCK
10	UEXT_#CS



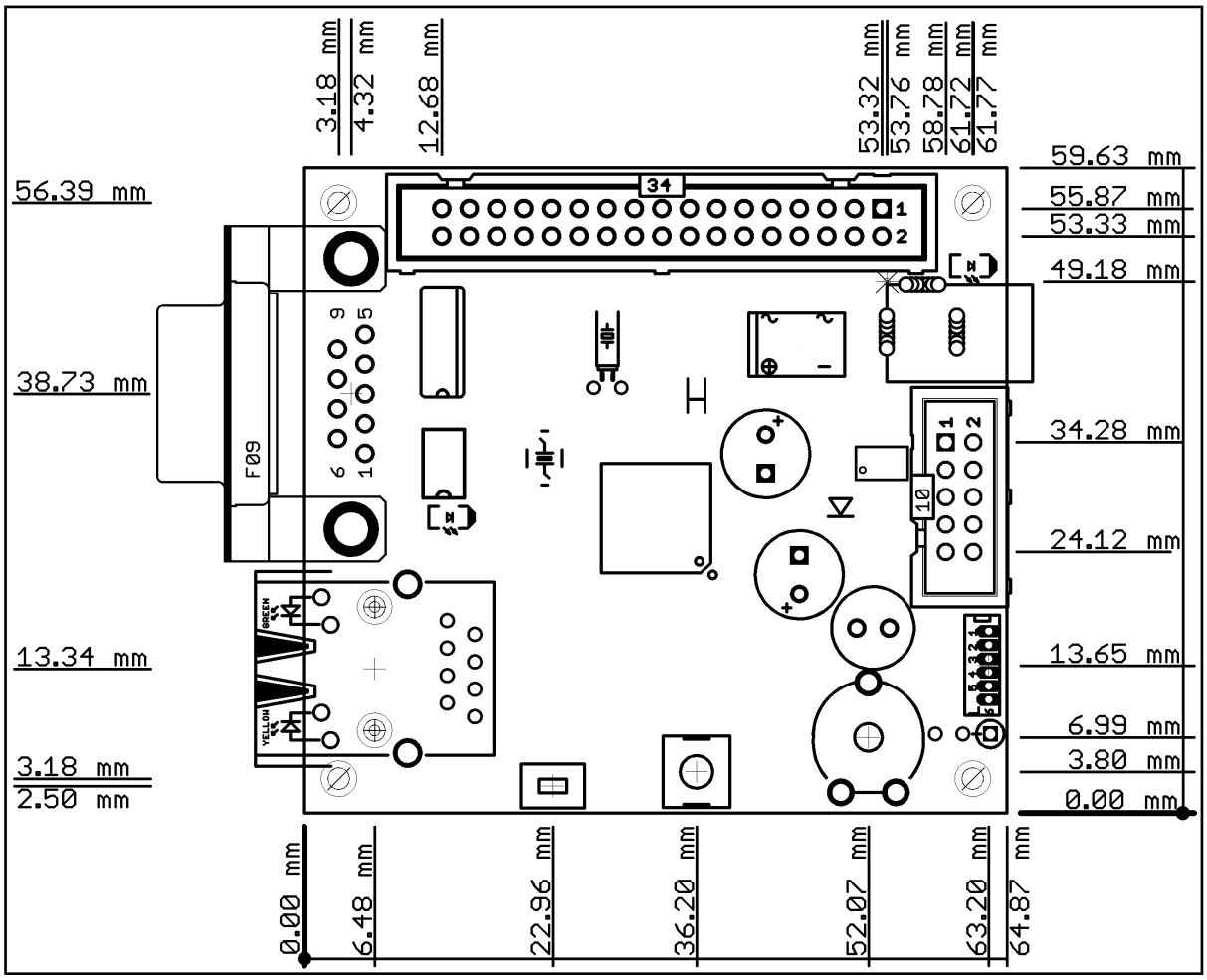
LAN

Pin #	Signal Name
1	TPOUT+
2	TPOUT-
3	3.3v
4	NC
5	NC
6	NC
7	TPIN+
8	TPIN-



LED	Color	Usage
Right	Yellow	Activity
Left	Green	100MBits/s (Half/Full duplex)

MECHANICAL DIMENSIONS



Connecting and testing the board

The PIC-WEB rev.C manufactured after 1 april 2014, comes with a default code that content an Internet Bootloader and a demo program (web-server) based on Microchip's TCP/IP stack version 5.42.08 included in "Microchip Libraries for Applications" released on 15 june 2013.

The bootloader mode makes possible update of the firmware using LAN connection and TFTP.exe (see pages 28-29 of this manual or the README.txt inside the zip for more details) instead of programmer. In the first 4 seconds the bootloader mode will be active and after that if no uploading is triggered the main demo will start (in this moment the red user LED is on).

In addition to that there is a demo for UEXT interfaces and how we can manipulate devices connected to UEXT via PIC-WEB webpage.

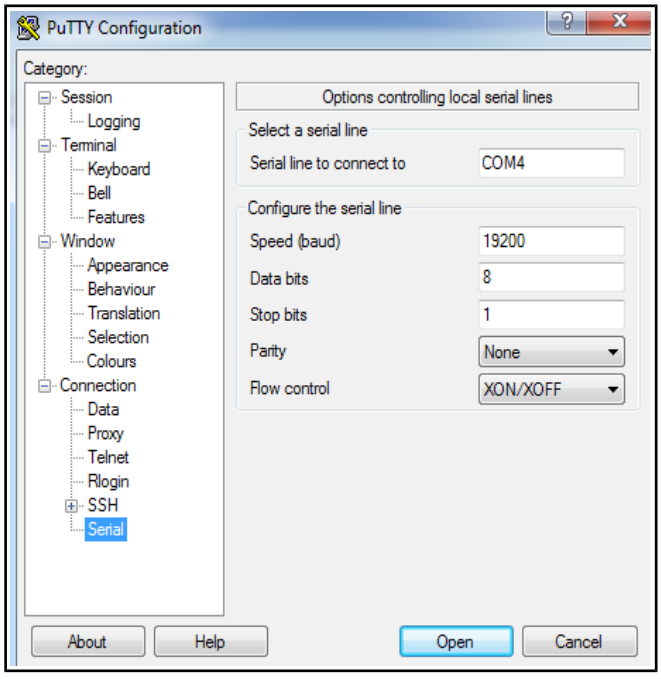
The older PIC-WEB comes with a default code – web server but with older stack version (TCP/IP 5.00) and without bootloader!!! So in order to use the latest version of the demo you need PIC-KIT3 or another programmer available for PIC18F67J60.

You can test the demo in a couple of simple steps. First of all you have to configure the Ethernet port to be able to work on your local network. That is possible trough the MCHPStack Configuration Console.

Using the PIC-WEB configuration console

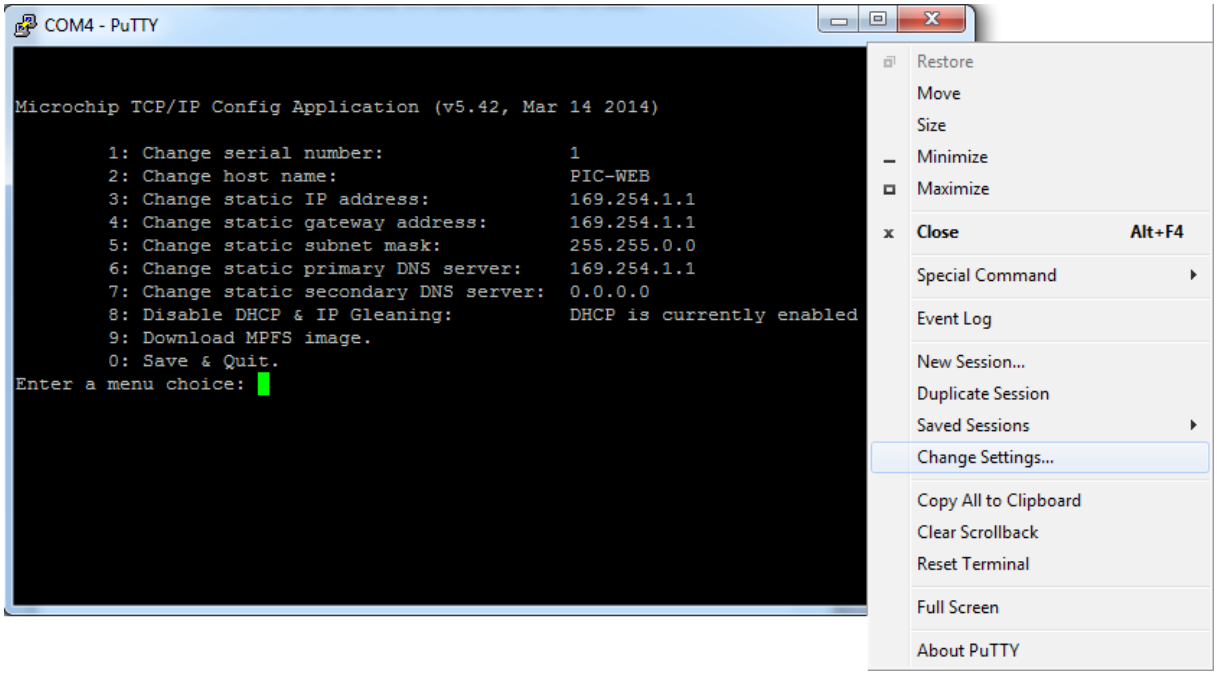
It's possible to modify the network configuration using the configuration console on the serial port, allowing a successful operation on your local network. Using the configuration console you can change the PIC-WEB IP address for example.

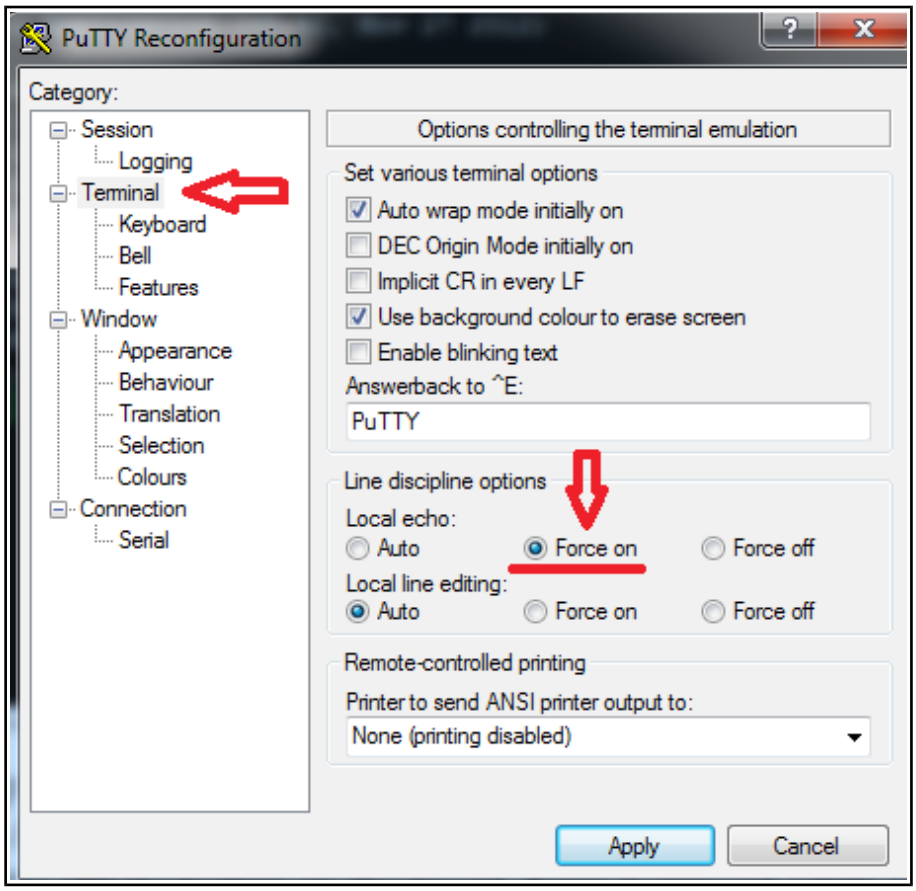
To access to the console menu it is necessary to have a serial DB9 cable and connect the board serial port to one available COM port on your computer. Then you will need to connect the board using a software like PuTTY. When you start it select down the menu **Serial** in category **Connections** and configurate the session as it's shown on the screenshot below.



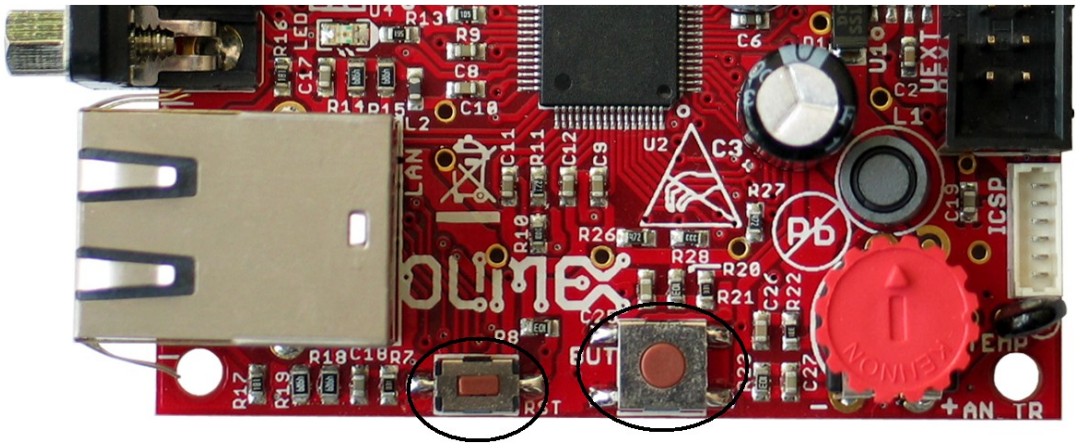
NOTE: The field “Serial line to connect to” should be with value depending on the com port where you have connected the board. You can check that on the device manager menu , category “Ports (COM & LPT)”.

These are the basic steps to configure the connection. If you want to see what you are typing you should activate the echo. It's shown below how it's done:





After this setup the connection with the PIC-WEB should be ready, but the console will not show anything!. That's because the board is not running on configuration mode. To run on that mode you just need to push the "BUT" button on the board. Keep it pressed while you push the "RST" button.



A menu will immediately appear on your console terminal (in our example PuTTY) showing following options:

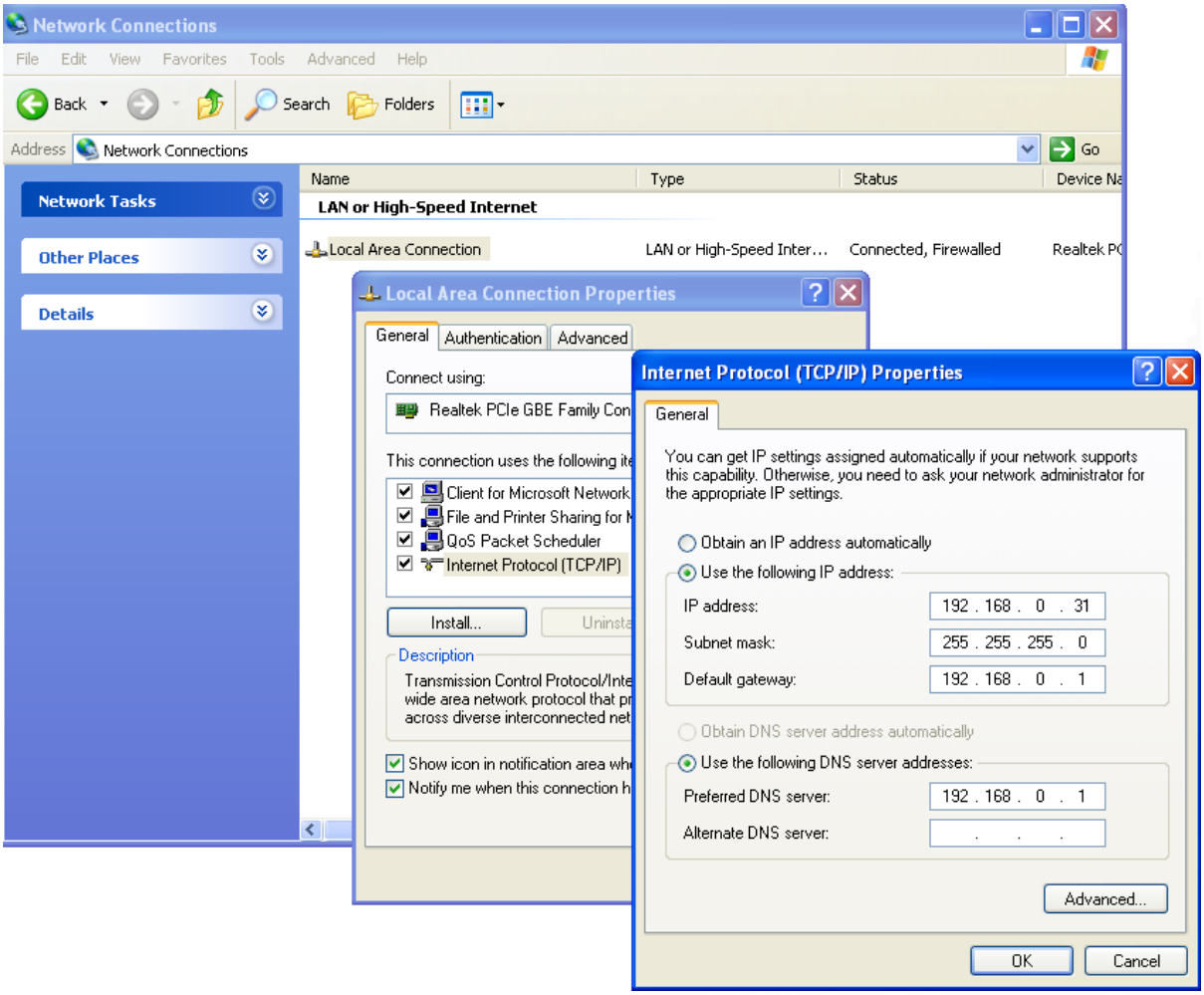
```
Microchip TCP/IP Config Application (v5.42, Mar 14 2014)

        1: Change serial number:              1
        2: Change host name:                  PIC-WEB
        3: Change static IP address:          169.254.1.1
        4: Change static gateway address:     169.254.1.1
        5: Change static subnet mask:         255.255.0.0
        6: Change static primary DNS server:  169.254.1.1
        7: Change static secondary DNS server: 0.0.0.0
        8: Disable DHCP & IP Gleaning:        DHCP is currently enabled
        9: Download MPFS image.
        0: Save & Quit.
Enter a menu choice:
```

The third option allow you to change the board IP number. Just type 3, then enter the new IP compatible with your local network configuration. After that push ENTER and return to the main menu again. In this case DHCP must be disabled. Otherwise it will ignore your input.

Now you must configure the other network parameters: gateway and subnet mask or if you prefer you can enable the DHCP to get the configuration from your router. The first and the second options are not used in this manual. At this moment we will only use the on-board default page.

The last option saves the configuration and restarts the PIC-WEB.

For testing purposes you can connect the board directly to your computer with a crossover ethernet cable , configure the board with 192.168.0.32 address, 192.168.0.1 gateway, disable DHCP (option 6) and configure the Ethernet adapter on your computer with 192.168.0.31 and the same gateway. Here is an example of windows configuration:



This configuration will let you test the board directly from your PC but isn't too useful. The fun stuff begins when you have the PIC-WEB connected to internet. Just imagine your sensor monitor project, but now you will be able to see the information anywhere just browsing the address of the board!

Test WEB page:

As it was mentioned above, the PIC-WEB board has an embedded web server and a demo page. The page shows some of the features of the board and like peripherals and UEXT interfaces demo.

To access the demonstration page, the server must be accessible from the computer. The default IP address of the board is 192.168.0.30, and 192.168.0.1 is the gateway. Those values must been set to work with your net. In this manual we have set IP address of the board to 192.168.0.171 (from the DHCP). Then you can get the page with any web browser writing the IP address of the board on the address bar.

At the picture below, you can see the default page that you must get. It shows the temperature of the on-board thermistor, the status of the button BUT, the value of the potentiometer, the status of the LED, software reset button and so on.

TCP/IP Stack Demo Application

- Overview
- UART Demo
- I2C Demo
- SPI Demo
- Dynamic Variables
- Form Processing
- Authentication
- Cookies
- File Uploads
- Image Uploads
- Send E-mail
- Dynamic DNS
- Network Configuration
- SNMP Configuration

Welcome!

Stack Version: v5.42
Build Date: Mar 14 2014 00:08:00

Red LED: (click to toggle)

Buttons:
^

Potentiometer: 600

Temperature: 28

Reset

This site demonstrates the power, flexibility, and scalability of an 8, 16, or 32-bit embedded web server. Everything you see is powered by a Microchip PIC microcontroller running the Microchip TCP/IP Stack.

On the right you'll see the current status of the demo board. For a quick example, click the LEDs to toggle the lights on the board. Press the push buttons or heat up the thermistor and you'll see the status update immediately. This examples uses AJAX techniques to provide real-time feedback.

This site is provided as a tutorial for the various features of the HTTP web server, including:

- **Dynamic Variable Substitution** - display real-time data
- **Form Processing** - handle input from the client
- **Authentication** - require a user name and password
- **Cookies** - store session state information for richer applications
- **File Uploads** - parse files for configuration settings and more

Several example applications are also provided for updating configuration parameters, sending e-mails, and controlling the Dynamic DNS client. Thanks to built-in GZIP compression support, all these tutorials and examples fit in the 32kB on-board EEPROM!

There is also an ICMP client example running on the demo board. Pressing the rightmost button will cause the board to send an ICMP Echo Request (a ping) to a Microchip web server. If the ping was received and echoed successfully, the response time will be displayed on the LCD. An error message will be displayed when attempting to use this demo if the board isn't able to connect to the Internet.

For more information on the Microchip TCP/IP Stack, please refer to the TCP/IP Stack API installed with the stack. This manual can be launched from your Windows Start menu.

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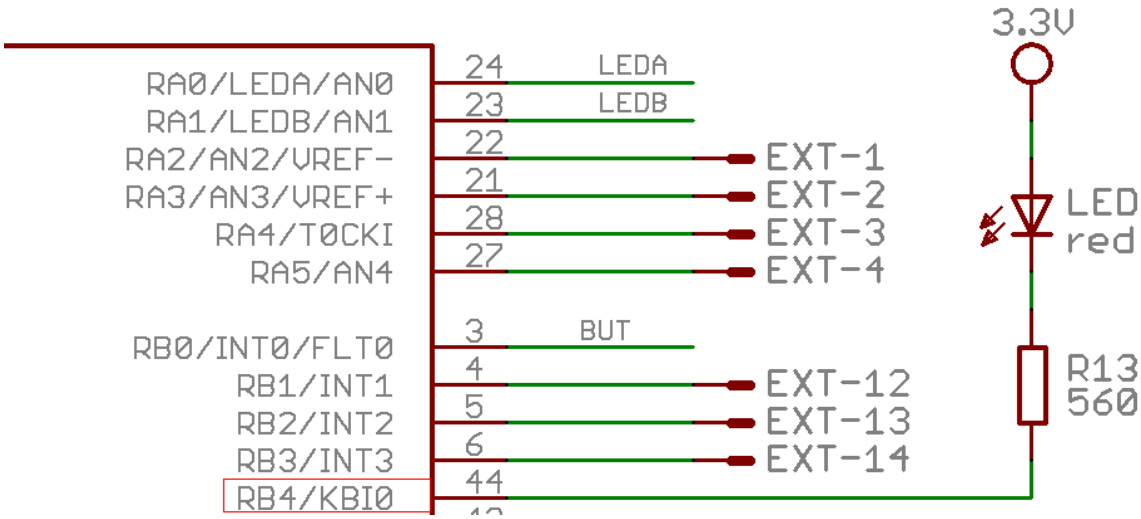
To toggle the status LED of the board (PIC-WEB) you can click on the green dot under the caption “LEDs:”. By clicking on this dot you are changing the state of the pin, see how the led switch on or switch off. From the I2C Demo menu you can send command via UEXT to a MOD connected to the extension.



At the page you can also see some values of the PIC-WEB sensors and buttons:

- Buttons:
- Potentiometer:
- Temperature:
- Reset

“Potentiometer” shows a measurement from the PIC A/D connected to a 10KΩ potentiometer on the board, you can freely change that potentiometer position and check how the measurement changes.

“Temperature” shows the value of the temperature sensed by the thermistor in the board connected to another A/D port of the PIC18F67J60.

“Buttons” shows the state of the on-board button. It is “^” while the button is not pressed and “V” if it is pressed.

"Reset" - The reset button allows you to reboot the board from distance. You can use this option in order to upload new firmware for example.

From the UART/I2C/SPI Demo menus you can send command via UEXT to any of these three interfaces MOD devices connected to the extension.

Uploading pages to the server

There are 2 easy ways to upload pages to the server, but you will always need to convert the files you want to upload in a MPFS file format. One other way is to include the web page on the source code and link it in a project, but if we did it in this way we won't use the external Flash (AT45DB011) included in the platform wasting program memory, that is reason this method will not be included in this manual.

Microchip File System (MPFS)

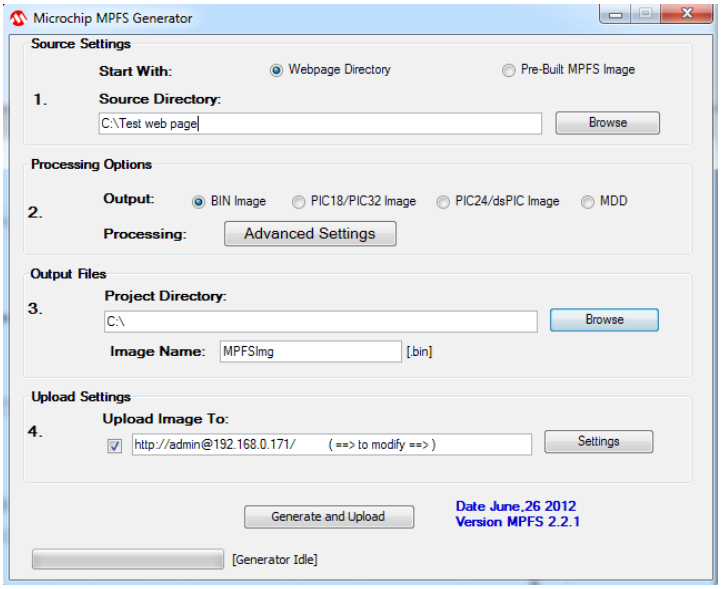
The implemented HTTP server uses the MPFS simplified file system to store the pages on the embedded system. That is why it is necessary to transform the files to that file system before uploading them. This is done using a program included in PIC-WEB software called "**MPFS2.jar**". It is located at: <extraction dir>\PIC-WEB 5.42 UEXT Full\Microchip\TCPIP Stack\Utilities\MPFS2.jar.

Let's create a simple "Hello World" page and upload it in to the HTTP server.

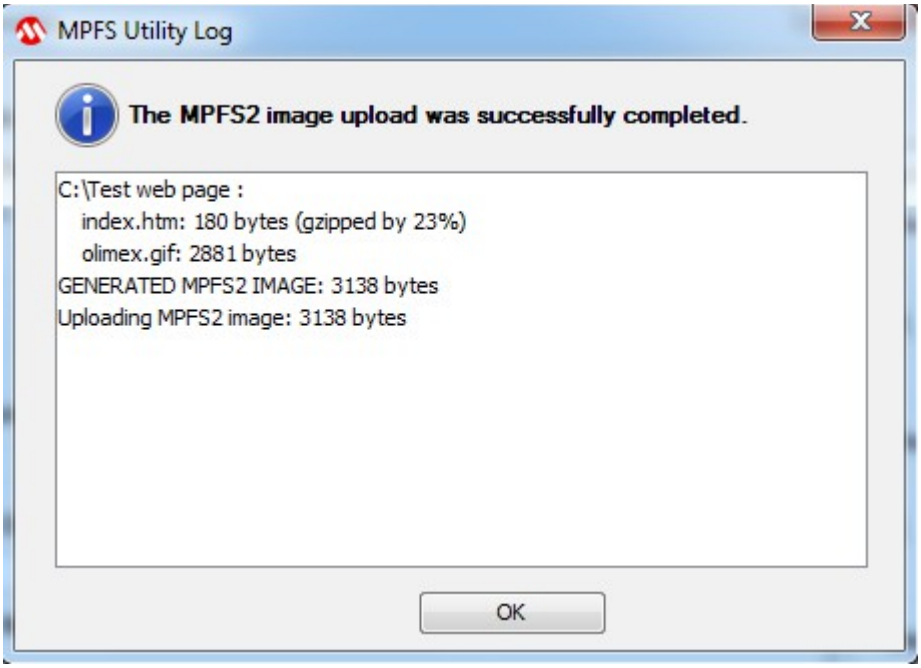
First of all it's necessary to create a directory on your PC where to put the files you want to upload to the web server. The "index.htm" is a must have file because that is the default page read by the server. We will also upload a picture "olimex.gif" (get it from the site for example). The code of the page is the simplest possible:

```
<HTML>
<HEAD>
<TITLE>Hello World</TITLE>
</HEAD>
<BODY>
	<p align="center">
		<img border="0" src="olimex.gif">
	</p>
	<font face="Arial" size="10"><p align="center">
		<b>Hello World!!!</b>
	</p></font>
</BODY>
</HTML>
```

Next thing to do is just start the MPFS2.jar utility and set up the required fields. Here is a screenshot of one possible configuration:



A very handy feature of the utility is point 4, which may be used to automatically upload the image to the board after a successful convertion. Enter the IP of your board and leave the other fields at defaults. Press the 'Generate and Upload' and wait for your new image to be generated and uploaded. This is a sample of the result of a successful upload:

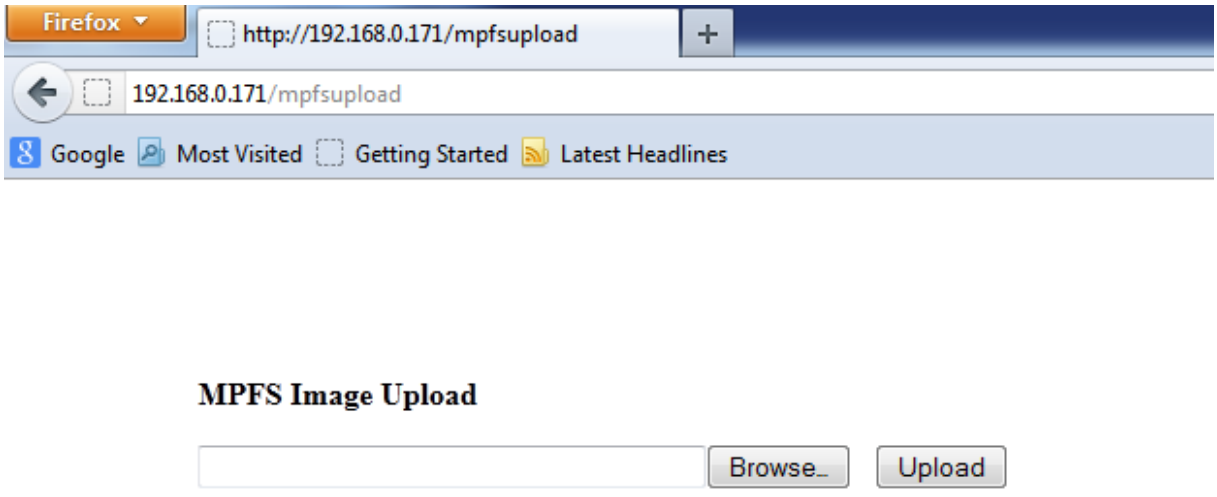


Please note that an image file (in this case MPFSImg.bin) is generated and may be used later if you select the 'Pre-built MPFS image' radio button at the top of the utility program window.

Another way to upload an image for the web server is through the web server itself. You will need a pre-built image (yes, should be built by the MPFS2 utility again) somewhere in your PC's file system. In your favorite browser type the IP of the board with the following path:

http://192.168.0.171/mpfsupload

Here is a screenshot of what you will see:



Now point to the image file and press 'Upload'. Sit back and relax while the upload takes place and then navigate to the home page to behold the new page just uploaded.

The result will be:

Installing the development environment

The web page that we wrote in last chapter obviously doesn't have any utility for any application at all. The idea of the PIC-WEB is to have control of the PIC18F67J60 features over the net using dynamics web pages or others TCP/IP protocols included in the Microchip Stack. In this manual we will explain how to create a dynamic web page, but this isn't the limit of the PIC-WEB and the TCP/IP Stack, you can get further to reach the full capacity of this platform and manage other protocols of network communication between the PIC microcontroller and any client or server in the network.

The PIC-WEB comes with compiled and installed software that can also be downloaded from Olimex web page, this software is based on two basics components from Microchip plus a C compiler. These components are the Microchip TCP/IP Stack, Microchip MPLAB/MPLABX IDE the PIC microcontroller software development platform and a compatible compiler that can be Microchip C18 (3.44 for this demo).

It will be also necessary to continue with this manual to have an ICSP programmer for the PIC18. It is advisable that this programmer be compatible with MPLAB/MPLABX IDE and would be better to have debugger too, but the last one isn't necessary. You can upload programs to the PIC-WEB with any programmer and software compatible with PIC18 like Olimex's PIC-Kit3 programmer.

MPLAB Integrated Development Environment

MPLAB IDE is free software distributed by Microchip that includes a toolset for development of PIC microcontroller applications for windows OS. It basically integrate transparently other modules like C18 compilers that strengthen the functionality of MPLAB and let us program in C language by example.

Installation: After you have downloaded MPLAB IDE from Microchip page, you must decompress it in any directory and execute the installation file (something like "Install_MP892.exe") following the typical windows software installation.

Complete installation is recommended to avoid compatibility troubles in the project.

MPLAB C18 Compiler

MPLAB C18 is a C compiler intended for the PIC18 family from Microchip. In our case is the needed compiler because the PIC-WEB platform uses the PIC18F67J60. This software converts C code into PIC18 machine code and link them together into a "*.HEX" file with the proper memory mapping for the microcontroller just ready to be programmed on it.

Installation: After downloading you must execute the installation file (something like "MPLAB C18 v3.44.exe") and follow the usual steps.

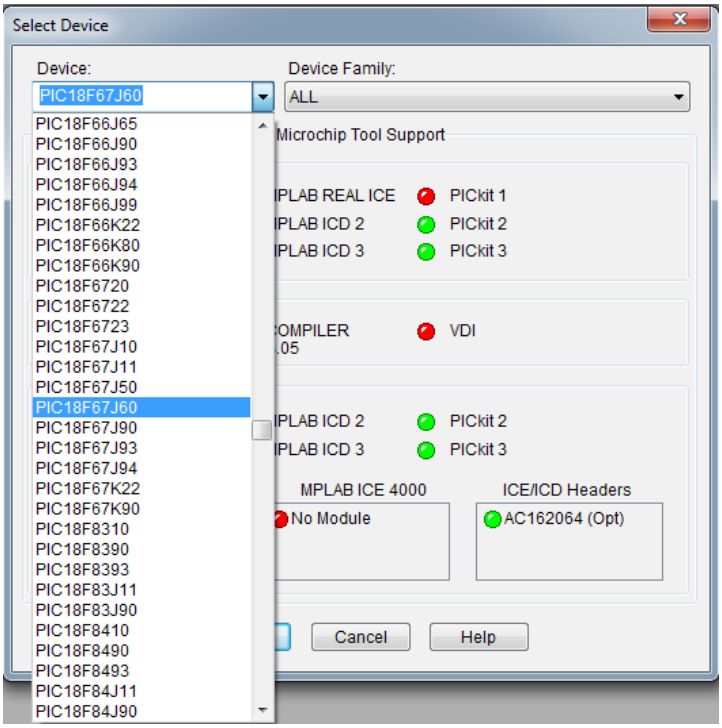
Microchip TCP/IP Stack

The Stack is an application included in Microchip Libraries for Applications 2013/06/15, developed by Microchip for been used in its PIC18 family and intended for Microchip C18 (this demo is tested with 3.44). You can download it from microchip page and we encourage you to download its manual for reference purpose.

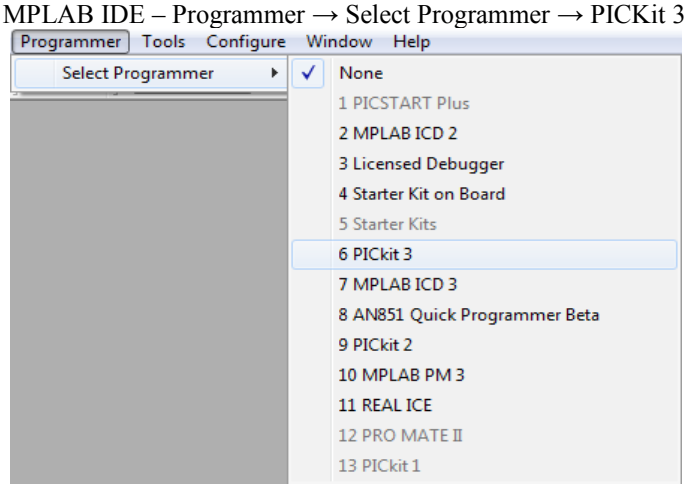
Programmer

There are several ways to program a PIC, but the easiest and proper way to program the PIC-WEB is using a compatible programmer with an ISCP connector and compatible with MPLAB IDE. For this purpose it will be used an USB programmer compatible with MPLAB 8.92 and MPLABX 1.95 PIC-Kit3 sold by Olimex.

PIC-KIT3: to use this programmer first of all you must have it connected to the PC trough an USB cable. Then you must select in MPLAB IDE – Configure → Select Device... A new window will appear. Here you should select your device – PIC18F67J60. Here is a screenshot of this window:



Then you must select in MPLAB IDE – Programmer → Select Programmer → PICKit 3.

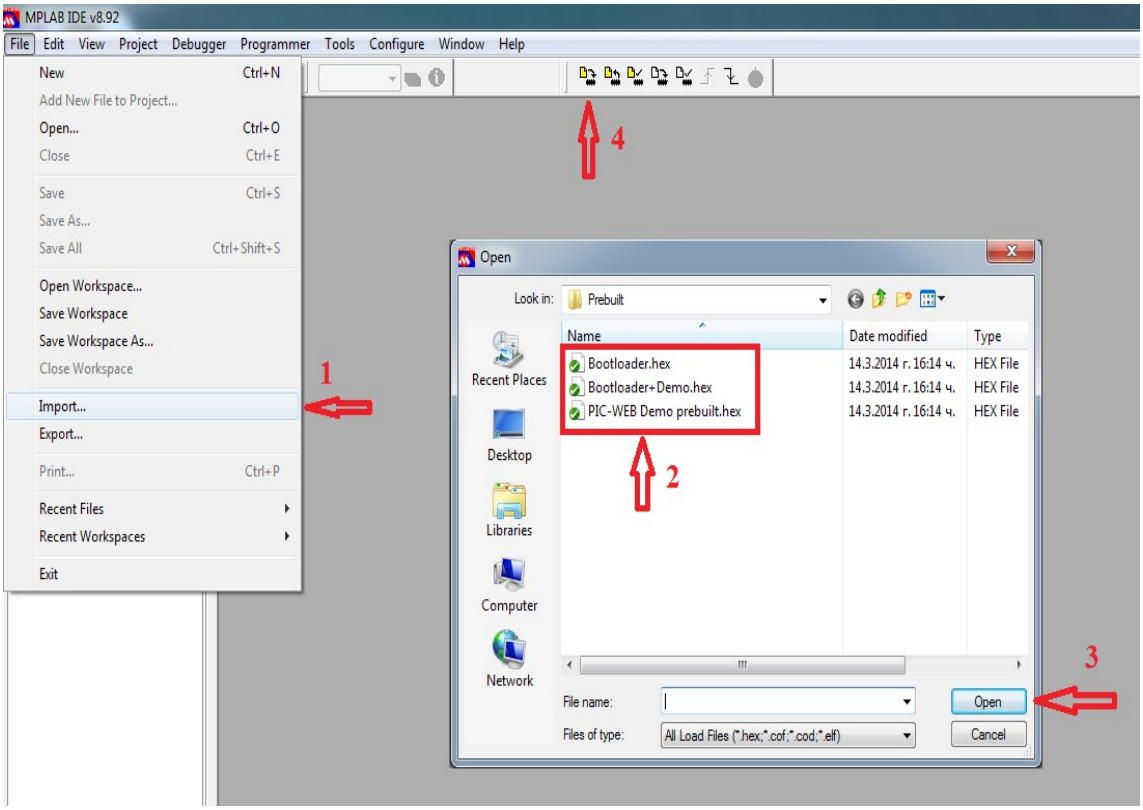


Wait while MPLAB is downloading operation system, and after Pic-Kit3 is connected – check in menu Programmer – Settings – Power – there is option – Power target circuit from PicKit3 – this option should be forbidden, you could not select it. Now it is safe to connect the programmer to your target board trough an ISCP cable. The PIC-WEB should be connected to the power supply.

If you have something already compiled, you can open the "*.hex" file and then program it to the PIC-WEB. Just importing the "*.hex" file in File → Import menu. If you don't have something already compiled, you can use some of the "*.hex" files offered by Olimex Ltd.

After you have done everything correctly you will have ready to use "*.hex" files. You can program with it by importing it. "**File → Import...**", select path: "**<extraction directory>\PIC-WEB 5.42 UEXT Full\TCPIP\Prebuilt\PIC-WEB Demo prebuilt.hex**" (you can also use the "Bootloader+Demo.hex").

For programming the PIC just push the program button on the tools or selecting the menu Programmer → Program. To do this follow the steppes in the next screenshot:



On step 2 you should choose the specific hex you want to program: bootloader; bootloader + demo; only demo.

Programming via LAN BootLoader (BL)

All mentioned in the previous chapter is about the old fashion programming using ICSP programmer. The latest demo (which is uploaded on the new PIC-WEB boards) provides a BL that makes possible remotely updating the firmware without programmer! To do this you must have:

1) already uploaded BL – as it was mentioned above the new boards will have it, but the older won't. So if your board doesn't have the BL but you want to use the it you must program the board with programmer. You must do this as well in case you erase/reprogram the memory with a firmware without BL.

2) access to the board – of course you must be able to connect to the IP address of the board **IN BOOTLOADER MODE**. By default the BL IP address is 192.168.0.200.

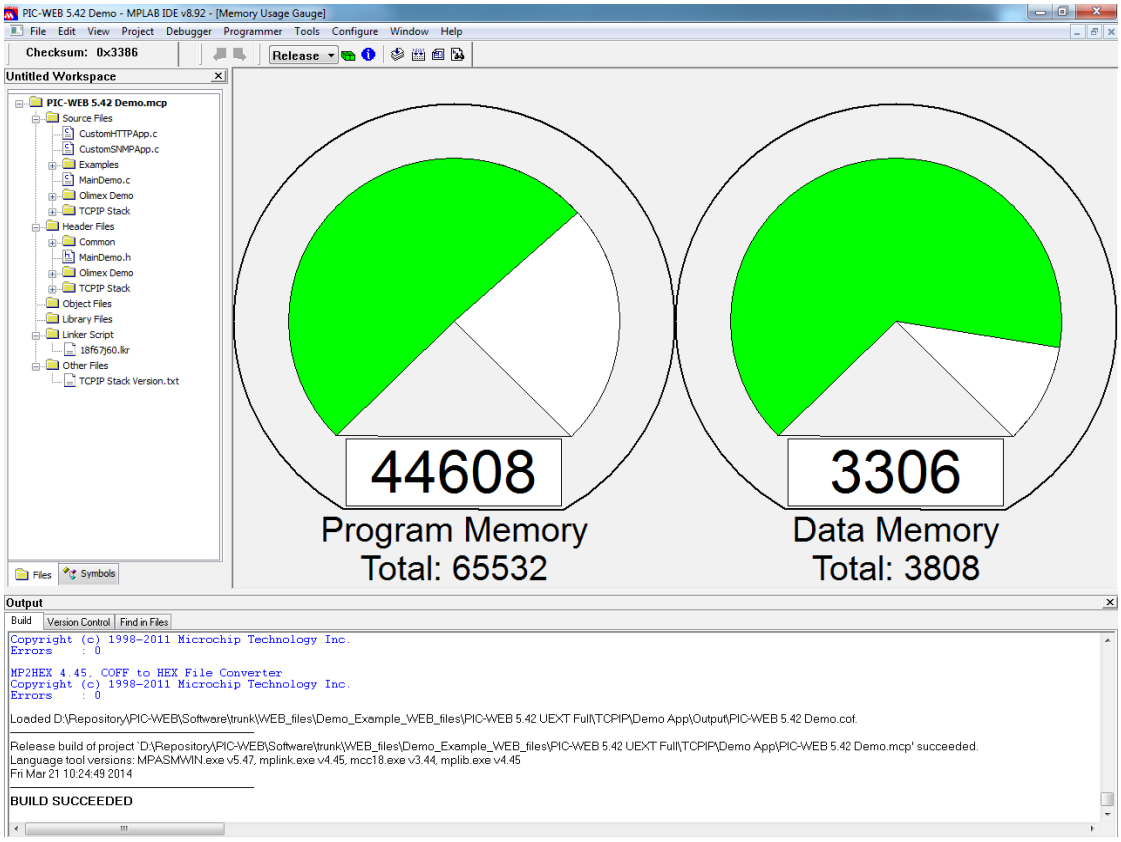
3) appropriate hex file – this BL enforce some size limitations. So if you want to upload a specific hex file make sure it isn't bigger than 121788 bytes. For more details about the BL check this link, section 7.2.2.Internet Bootloader, pages 117-123: http://www.egr.msu.edu/classes/ece480/capstone/fall11/group03/TCPIP%20Stack%20Help.pdf

4) TFTP.exe installed on your PC – in Windows Vista and 7 TFTP.exe isn't available by default. In order to enable it check this link: http://avtech.com/Support/index.php?action=kb&article=108

Here is an example of how can we do the whole procedure:

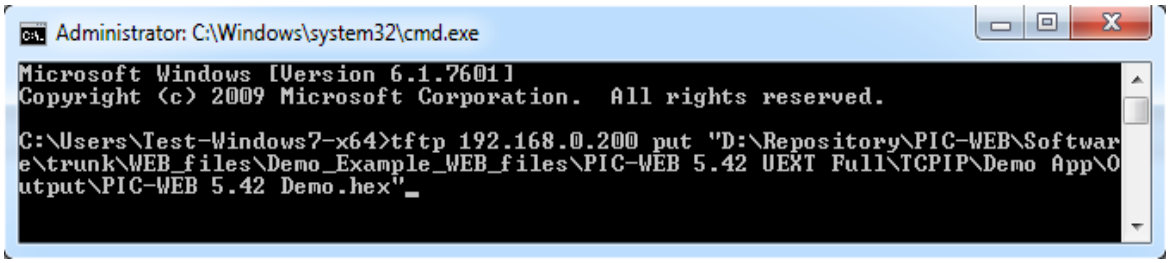
1) Uploading BL to the board (this point isn't necessary in case you already have BL) – you can do this either:
 - import the prebuilt hex file inside the demo zip of PIC-WEB: "**<extraction directory>\PIC-WEB 5.42 UEXT Full\TCPIP\Prebuilt\Bootloader.hex**"
 - rebuild the BL project which is also provided on the PIC-WEB product page: "**<extraction directory>\PIC-WEB bootloader\TCPIP\Internet Bootloader\Internet Bootloader.mcp**"

2) Preparing the hex file – you must have a hex file within the limits mentioned above. The most common way is to compile a project using MPLAB/MPLABX.

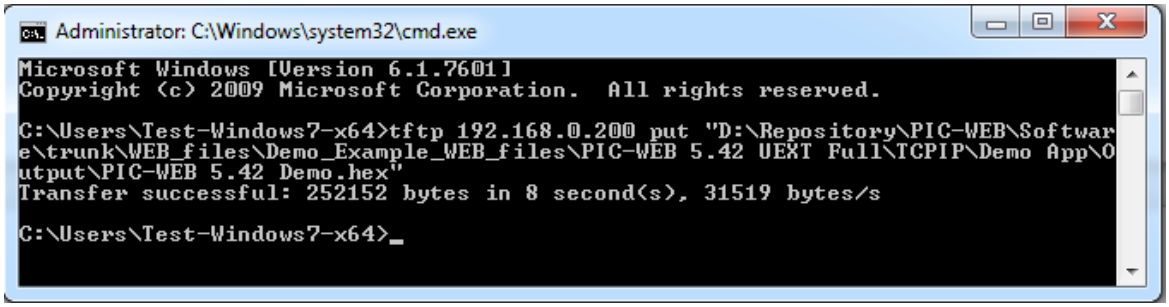


As you can see this demo is within range since it is smaller than 60894 words (121788 bytes). So we can upload it using the BL.

3) Uploading the hex via Internet BL – go to Start Menu → Run → cmd.exe. Prepare to trigger the uploading by entering the command line. The format is:
tftp <IP> put <hex file>



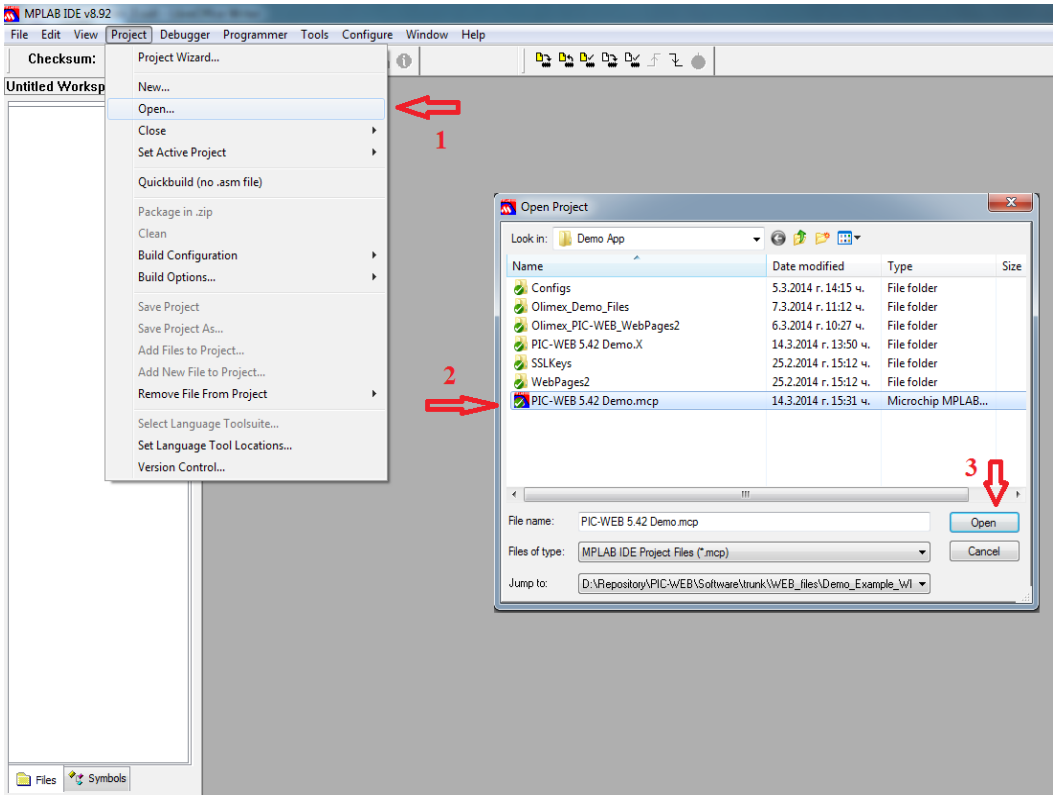
Now reset the board, within next 4 seconds (while BL is active) trigger the command in console and wait few seconds until uploading is complete. If everything is fine you should get message like this:



From now on when you reset the board within the first 4 seconds the BL will be active (in case you want to update the firmware) and ofter that the hex you upload.

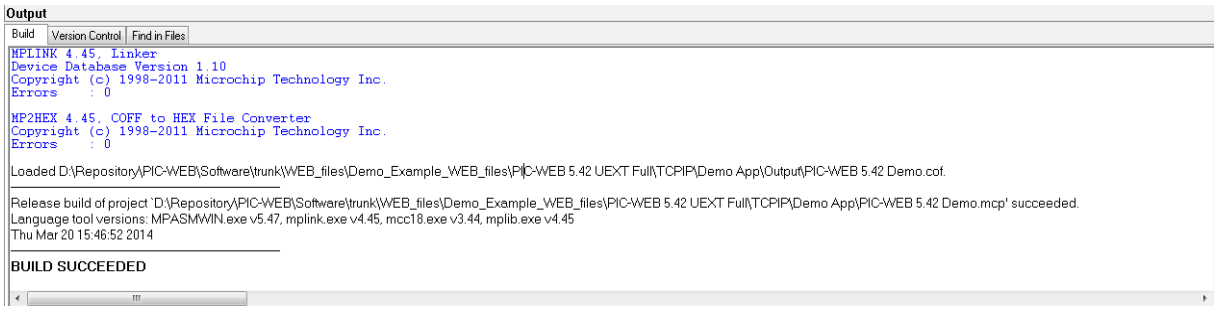
PIC-WEB Software

After downloading the necessary PIC-WEB software and executing the instructions in “README.txt” file, you will have a working demo. Open this project “**<extraction directory>\PIC-WEB 5.42 UEXT Full\TCPIP\Demo App\PIC-WEB 5.42 Demo.mcp**”



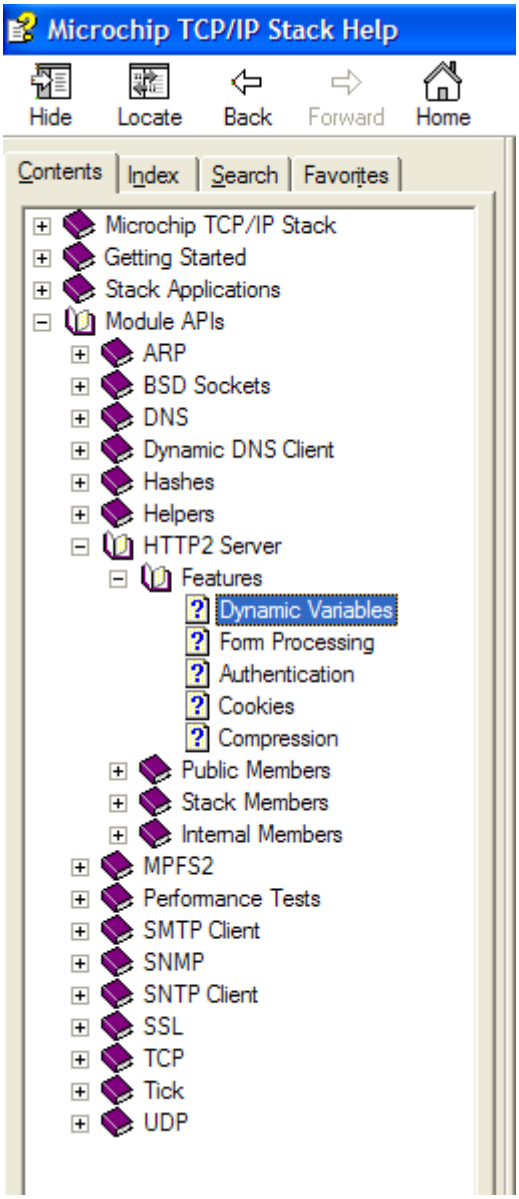
Now is time to compile! If there aren’t bad configuration the compilation must be successful, that means that you have to get the “BUILD SUCCEEDED” message on the output window.

Note: the version of the MPLAB IDE that you are using can change the last explanation, newer version will appear since this manual was written or you can have an old one, that’s means that the software configuration steps can change a little but the main idea is the same. Don’t hesitate if it doesn’t work on the first time, just keep trying isn’t complicate.



Dynamic Web Pages Creation

For dynamic web pages creation you should refer to .\Microchip\Help\TCPIP Stack Help.chm at your computer. But since all help files are removed from the demo zip with the idea to be as small as possible if you want to read the help files you will have to download the Microchip Libraries for Applications v2013-06-15 from here: http://www.microchip.com/pagehandler/en-us/devtools/mla/. There you can find all the necessary information, following the way, shown at the screenshot below:



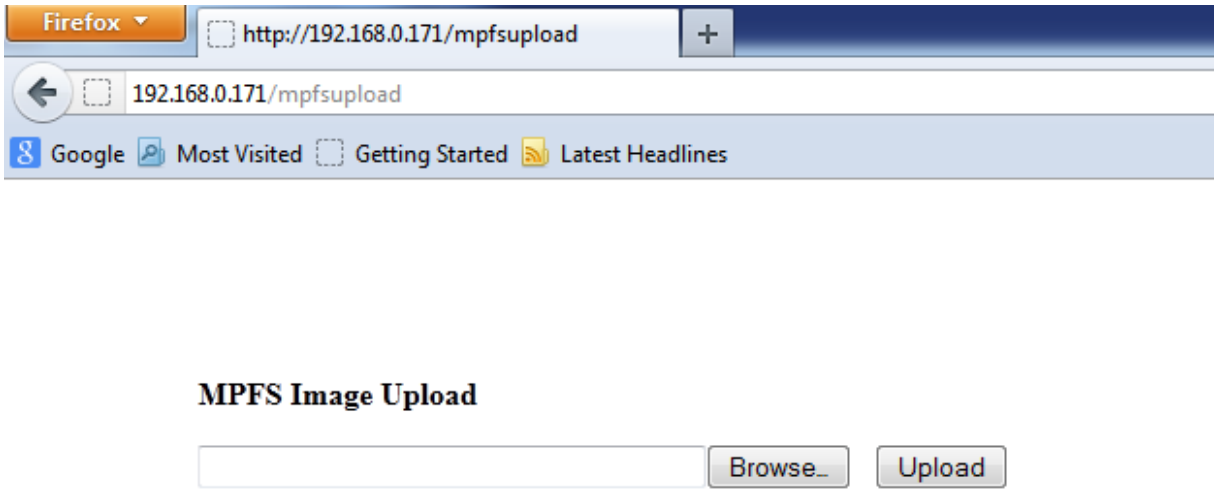
Restore procedure:

If you want to restore Olimex's original software you should program PIC18F67J60 with "**<extraction directory>\PIC-WEB 5.42 UEXT Full\TCPIP\Prebuilt\Bootloader+Demo.hex**" from MPLAB IDE.

After you have load this "*.hex" file, you should open "**<extraction directory>\PIC-WEB 5.42 UEXT Full\Microchip\TCPIP Stack\Utilities\TCPIP Discoverer.jar**" Click on the button "Discover Devices" and the IP address of PIC-WEB will be discovered (for example - 192.168.0.171). Note that your LAN must have DHCP server. In your browser type the IP of the board with the following path:

http://192.168.0.171/mpfsupload

Here is a screenshot of what you will see:



Click on the button "Browse_" to select the "*.bin" file you are about to upload. Select the image file in directory **"<extraction directory>\PIC-WEB 5.42 UEXT Full\TCPIP\Prebuilt\MPFSImg2 Prebuilt.bin"** and press 'Upload'. Sit back and relax while the upload takes place and then navigate to the home page to behold the page just uploaded.

Now your PIC-WEB is with Olimex's original software.

AVAILABLE DEMO SOFTWARE

Microchip TCP/IP Stack 5.42 – modified for PIC-WEB REV.C, suitable both for MPLAB 8.xx and MPLAB X

Microchip TCP/IP Stack 5.31 – modified for PIC-WEB REV.C, suitable only for MPLAB 8.xx, created by Paolo Chiarabaglio

Production test based on TCP/IP Stack 5.00 – modified for PIC-WEB REV.C, suitable only for MPLAB 8.xx

ORDER CODE

PIC-WEB - completely assembled and tested.

How to order?

You can order directly from our e-shop or from any of our distributors. The list of distributors is available at the following address: https://www.olimex.com/Distributors/

Check our web https://www.olimex.com/ for more info.

Revision history:

Board's revision:	Rev. C	- created May 2011
Manual's revision:	Rev. Initial	- created November 2012
Manual's revision:	Rev. B	- created December 2012
Manual's revision:	Rev. C	- created March 2013
Manual's revision:	Rev. D	- created April 2014

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The software is released under the conditions of the Microchip's Application Libraries. To use it you have to agree with their conditions. In the projects released there should be a copy of the Microchip Application Solutions Users Agreement.pdf

It is possible that the pictures in this manual differ from the latest revision of the board.

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For product support, hardware information and error reports mail to: support@olimex.com. Note that we are primarily a hardware company and our software support is limited.

Please consider reading the paragraph below about the warranty of Olimex products.

Warranty and returns:

Our boards have lifetime warranty against manufacturing defects and components.

During development work it is not unlikely that you can burn your programmer or development board. This is normal, we also do development work and we have damaged A LOT of programmers and boards during our daily job so we know how it works. If our board/programmer has worked fine then stopped, please check if you didn't apply over voltage by mistake, or shorted something in your target board where the programmer was connected etc. Sometimes boards might get damaged by ESD shock voltage or if you spill coffee on them during your work when they are powered.

Please note that warranty do not cover problems caused by unproper use, shorts, over-voltages, ESD shock etc.

If the board has warranty label it should be not broken. Broken labels void the warranty, same applies for boards modified by the customer, for instance soldering additional components or removing components - such boards will be not be a subject of our warranty.

If you are positive that the problem is due to manufacturing defect or component you can return the board back to us for inspection.

When we receive the board we will check and if the problem is caused due to our fault and we will repair/replace the faulty hardware free of charge, otherwise we can quote price of the repair.

Note that all shipping back and forth have to be covered by the customer. Before you ship anything back you need to ask for RMA. When you ship back please attach to it your shipping address, phone, e-mail, RMA# and brief description of the problem. All boards should be sent back in antistatic package and well packed to prevent damages during the transport.